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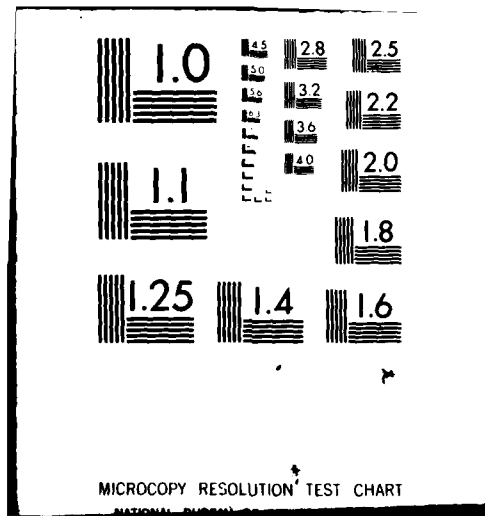
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REPORT

LITERATURE REVIEW OF SURVEYS, METHODOLOGIES, INVENTORIES
AND ANALYSES PERTAINING TO RECREATION BOATING, BEACHES,
COMMERCIAL FISHING AND CHARTER BOAT OPERATION
IN THE GREAT LAKES

MRI Project No. 4782-D

November 19, 1979

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PREFACE

Midwest Research Institute is pleased to submit this report to the Buffalo District, U.S. Army Corps of Engineers. The report contains the literature review developed during the conduct of MRI Project No. 4782-D, Contract No. DACW49-79-C-0056. The report presents a brief description of major research in the areas of commercial fishing and charter boat operations, marinas and boating, beaches and swimming, recreation cost-benefit analysis, and recreation demand analysis.

The project leader for this study was Mr. Raymond M. Mischon, Manager, Leisure/Recreation Programs. The Principal Investigator for this portion of the study was Mr. Thomas E. Peterson, Assistant Recreation Economist.

MIDWEST RESEARCH INSTITUTE

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INTRODUCTION

The Great Lakes Basin provides a good quality of life through its beautiful scenery, fishing, swimming, power boating, and sailing, as well as through the agricultural, mining, manufacturing, power, and transportation industries.

This bibliography presents a review of the literature that was developed as a part of a study conducted by Midwest Research Institute (MRI) for the Buffalo District U.S. Army Corps of Engineers. The overall objective of the study was to determine the effects proposed water level regulation plans would have on certain Great Lakes beaches, boating facilities, commercial fishing and charter boat operations.

In addition to utilizing two national computerized literature services,^{1/} a number of state, university and local sources were examined. For the purpose of clarification, the various studies, findings, and methodology examined during our search are categorized as follows: (1) Marinas and Boating; (2) Beaches and Swimming; (3) Commercial Fishing and Charter Boating; (4) Demand Analysis; (5) Cost-Benefit Analysis; and (6) Miscellaneous Studies.

^{1/} National Technical Information Service and Smithsonian Science Information Exchange.

MARINAS AND BOATING

MARINAS AND BOATING

Prior to 1900, little thought was given to the recreational boating potential of our rivers and lakes. Waterways were routes of commerce. With the development of the internal combustion engine at the turn of the 20th century, engine and boat manufacturers joined together in the design and construction of boats and marine engines. Since that time recreational boats in use in the United States have increased from an estimated 15,000 in 1904 to almost 9 million registered boats in 1970.

Growth in recreational boating can be attributed to a number of factors. These include the development of the modern outboard motor with its higher horsepower and its capabilities for high speed water travel, which makes water skiing possible; the use of fiberglass for construction; and the development of self-launching boat trailers, which make boating enthusiasts highly mobile. These advances, coupled with the general trends of a higher standard of living and more leisure time have brought people in ever-growing numbers to the Great Lakes Basin waterways. To meet their needs, private enterprise, local and state government, and the federal government have developed various programs and projects focusing on, conserving and developing water resources through classification and zoning of rivers, and construction, operation, and maintenance of reservoirs, harbors, launching facilities and marinas. The following is a brief review of the most recent work relating to recreational boating in the United States in general, and the Great Lakes in particular.

Anonymous. 1956

Study of Local Participation in Small-Boat Harbor and Channel Projects.

Board of Engineers for Rivers and Harbors, U.S. Army Corps of Engineers, Washington, D.C.

This study presents the results of an analysis of local participation in the development of small-boat harbors and channels. Current practices and policies involved in determining the economic worth of the projects and the basis of apportioning the costs between the federal government and local interests are considered. The benefits which accrue at various types of harbors and the circumstances under which they arise are analyzed. The reasons underlying the differentiation between general and local benefits are discussed, and some of the results of the application of the procedures prescribed in the directive of 3 February 1950 (superseded 1 June 1956) for evaluating benefits and allocating costs of small-boat harbor and channel projects, are reviewed.

The study finds that the methods and procedures devised for estimating and evaluating benefits from small-boat harbor and channel improvements are basically sound and generally meet the test of presently established

criteria for the appraisal of benefits expected from public works. However, the study reveals certain deficiencies in the methods used in the appraisal and treatment of some of the benefit items and in the manner in which the principles governing the allocation of costs are applied. Other deficiencies noted are due to the lack of basic information.

Anonymous. 1974

Marina Costs/Revenues Study--1974. National Association of Engine and Boat Manufacturers, New York City, New York.

This report is a survey revealing revenue sources, indirect costs and their profitability, profit ratios, slip rental and storage rates, launching fees, and labor rates for 75 marinas and boat yards in all parts of the United States.

Anonymous. 1974

Lake Michigan Regional Boating Study and Analysis. U.S. Army Corps of Engineers, Chicago, Illinois.

The objectives of the Lake Michigan Recreational Boating Study (LMRBS) were twofold. The first objective was to describe and analyze the present patterns of boating on Lake Michigan via the information provided by a sample survey of boaters in the region. The second objective was to estimate the change in demand for Lake Michigan boating facilities. By combining the present boating patterns and the demand projection, an indication of the new small boat harbor facilities likely to be needed in the future could be obtained. This information would then be used as a guide towards the recommendation of the quantity and combination of changes needed in small boat harbors along the shores of Lake Michigan. These changes include both the expansion of existing harbor areas and the construction of new harbors along the coast. This study is expected to serve as an attachment to detailed reports on individual harbor projects. It will provide the data and methods of analysis used in these individual reports.

Anonymous. (no date)

A Study of the Market Potential for Small Craft Marina Concessions at Lake Shelbyville. U.S. Army Corps of Engineers, St. Louis, Missouri.

This study constitutes an overall analysis of the existing commercial boat dock/marina concession facilities at Lake Shelbyville, Illinois, and the potential for further development of new facilities and/or the expansion of existing commercial facilities. The analysis involved considered the market limitations and potentials pertaining to Lake Shelbyville. In addition to the market factors which affect success of a commercial concession, the physical problems, limitations and potentials were also examined. The end product of this study is a determination of the potential market or lack of it for commercial marina concessions at Lake Shelbyville.

Anonymous. 1978.

Recreational Boating in the Continental United States in 1973 and 1976: The Nationwide Boating Survey. Office of Boating Safety, U.S. Coast Guard, Washington, D.C. NTIS: AD-A052-907.

A nationwide survey of 1976 boating activity was conducted by the U.S. Coast Guard in order to expand and clarify existing information on recreational boating. Using randomly generated telephone numbers, more than 28,000 households in the continental United States were contacted, and those owning and/or operating boats were interviewed. Results from these interviews were used to calculate population estimates. This report provides: (1) estimates of the numbers of pleasure boats and their characteristics; (2) information on safety and communication equipment on these boats; (3) boating household and operator characteristics and activities; and (4) attitudes towards the emergency assistance and boating education programs of the Coast Guard.

Boating Industry Associations. 1976

A Recreational Boating View of Coastal Management. National Oceanic and Atmospheric Administration, Washington, D.C. NTIS: PB-270-759.

The recreational boating business is made up of 19,000 firms directly engaged in making and selling marine products. It provides 350,000 direct, full-time jobs. Retail sales for the industry exceed \$4.8 billion and the industry's sizeable and growing exports provide a favorable contribution to the balance of trade. Specific problem areas and planning concepts for coastal zone planning for recreational boating include: access to recreational waters should be increased; the upgrading of commercial facilities should be encouraged by zoning existing marinas for boating; consider building new marinas with federal or state capital to be leased to private management; consider constructing large protected harbors in areas now unsuited for marinas through use of artificial breakwaters; where marinas and marshes can co-exist and where trade-offs are necessary, artificial marshes could be constructed on the dredged spoils; carrying capacities of waterways need to be determined; an island park system accessible by boats should be established nationally; accurate boating statistics are needed for sound planning; and federal funding should be more available for recreational use.

Betz, Converse and Murdoch, Inc. 1979

Development of Recreational Small-Boat Harbors on the Coast of Lake Erie in the Vicinity of Cleveland, Ohio. U.S. Army Corps of Engineers, Buffalo District, Buffalo, New York. Stage 1 Reconnaissance Report, September, 1979.

The U.S. Army Corps of Engineers, Buffalo District, retained Betz, Converse and Murdoch Inc. to prepare a Stage 1 Reconnaissance Report to determine whether a federal interest exists in developing additional

recreational boating opportunities in the Cleveland, Ohio area. The report presents an inventory of boating facilities in Cuyahoga and adjacent counties, and characterizes the existing fleet, launch ramp usage, and boating activity. Socioeconomic factors which characterize boaters, such as income and educational level, are identified and projected to the year 2025 for the four counties in the Cleveland SMSA. Based on the socioeconomic forecasts, the number of prospective boaters from each county is projected, as well as the type and size of boats owned by these prospective boaters. The percentage of boaters willing to travel to Cuyahoga County facilities is calculated using a travel decay function. The demand fleet is compared to the residual capacity of existing facilities to determine the need for additional boating facilities on Lake Erie in Cuyahoga County. It was found that there is sufficient capacity at existing facilities to accommodate sailboats in Cuyahoga County. However, there is a need to provide additional capacity for power boats, the greatest need being to accommodate inboard-outdrive motorboats, 16 to 25 feet in length.

Bromberg, Kenneth M. 1973.

Determination of the Number of Commercial and Non-Commercial Recreational Boats in the U.S. and Selected Characteristics. National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Washington D.C. NTIS: COM-74-11186.

Findings in this study are summarized in tabular form under the following headings: Estimated number of private recreational boats by size class and region; Estimated number of private recreational boats that fish in salt water over a 12-month period by state and size class; Estimated number of trips and the corresponding number of days spent in different kinds of salt water over a 12-month period by region and size class; Species of fish sought by private recreational boaters expressed as a percent of total area fishing trips; Estimated number of commercial salt water sport fishing vessels by region and size class; Estimated number of trips and the corresponding number of days spent in different kinds of salt water by commercial sport fishing over a 12-month period by region and size class; Species of fish sought by commercial sport fishing vessels expressed as a percent of total area fishing trips; and estimated annual gross revenue of commercial salt water sport fishing vessels by size class.

Brown, Tommy; Noden, R.; Eiler, D.

Adjustments of Commercial Marinas and Boaters to the Energy Shortage. Agricultural Experiment Station, Cornell University, Ithaca, New York. (Study is currently underway.)

A survey of New York's commercial marinas showed gross revenue increased from 1973 to 1974 for the majority of firms. This was primarily due to rental of more berths, increasing volumes of repair business, and boating supply sales. Gasoline sales did not increase, and new boat sales

decreased for most firms. The majority of owners of large boats sampled in conjunction with the second phase of the project reported they went boating less in 1974 or operated their boats at lower speeds to conserve fuel. Higher gasoline prices did not appear to force significant numbers to give up boating, however.

Cesario, Frank J.; Knetsch, Jack L. 1978.
Benefit Evaluation for Small Boat Harbors. Institute for Water Resources,
U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

The procedure for evaluating small boat harbor benefits was first developed around 1950 and has become commonly known as the "small boat formula." The basic ingredients of this formula as it is to be applied in the field are described in EM 1120-2-113, published in 1959. In view of the major advances in benefit-estimation methodology over the last decade, it seems appropriate to examine the small boat formula in a fairly systematic and critical way to help judge its role as an appropriate methodology for measuring recreational navigational benefits. This is the main purpose of the current study. This report examines the small boat formula in terms of accepted principles of benefit-cost analysis, points to its shortcomings, and suggests alternative ways of developing improved methods.

Crissman, Randy D.; Opara, Johnnie U. 1976.
Inventory of Lake Ontario Inlets and Harbors: Niagara River to Stony Creek.
New York Sea Grant Institute, Albany, New York. NTIS: PB-263-811.

This inventory of Lake Ontario inlets and harbors was conducted to determine the capacities and services of existing boating facilities, to investigate sites for future expansion, and to make recommendations for expansion. The one feature characteristic to nearly all of the inlets, except for the larger tributaries, is a barrier beach. Forty-five of the 61 inlets and harbors inventoried have some type of barrier beach formation. Based on analysis of the present supply of boating facilities and previous recreational boating demand projections, it is recommended that 3,000 additional mooring and/or slips and 50 launch ramps be provided by 1980. Recommendations for the distribution of the additional facilities, either through expansion or construction of new facilities, is also presented.

Crompton, John L.; Ditton, Robert B. 1975.
A Feasibility, Management and Economic Study of Marinas on the Texas Gulf Coast. Office of Sea Grant, National Oceanic and Atmospheric Administration,
Rockville, Maryland. NTIS: PB-247-571.

Twenty-nine marina operators were located on the Texas Gulf Coast in 1974. The study found that no new marinas had been developed along the Texas Gulf Coast in the previous 9 years. During this time, however,

boat sales had increased dramatically. The number of slips which became available through expansion at existing marinas between January 1971 and June 1975 was probably less than 10 percent of the total number of slips identified. As a result there was increasing pressure or demand on available slips. It was the unanimous opinion of the marina operators interviewed that no new marina could be constructed in today's financial climate and be a viable financial proposition.

Dunham, James W.; Finn, Arnold A. 1974.

Small-Craft Harbors: Design, Construction and Operation. Coastal Engineering Research Center, U.S. Army Corps of Engineers, Fort Belvoir, Virginia. Special Report No. 2.

Analytical data and design standards and procedures are presented for use in the development of small-craft harbors and launching facilities under a wide variety of conditions applicable to a broad spectrum of geographic locations. Environmental impact and governmental control aspects are discussed. Procedures for determining project feasibility and possible sources of governmental assistance are presented. Harbor operations and administration are reviewed. Several case histories of harbors are included.

Dawson, Chad P.; Brown, Tommy L. 1979.

Impacts of Manipulating Lake Levels on Recreational Boating in the Oswego River Basin, New York. Outdoor Recreation Research Unit, Department of Natural Resources, Cornell University, Ithaca, New York.

This study was an attempt to find the optimal lake levels for recreational boating in the Oswego River Basin, New York. Samples of boaters were surveyed to determine boating patterns, place and methods of boat launching, and negative benefits given changes in water levels. Marina operators were surveyed to determine the impacts of changing water levels on their operations. The findings were integrated into a model that estimates total damages to marina operators and boat owners when lake levels deviate from optimal levels.

Eiler, D.A.; Brown, Tommy

Marina Businesses and Users in New York. Agricultural Experiment Station, Cornell University, Ithaca, New York (Study is currently underway).

With estimated annual gross revenues of \$95 million, commercial marinas and boatyards represent one of New York State's most important recreational industries. Interviews with 161 of the nearly 700 firms in the state disclosed that marinas offer a wide array of boating services, but these services differ with respect to geographical location and size of firm. Typically, marinas are well established firms with high fixed costs operating on a small profit margin. Operators stated they were little affected by public marinas, and their most serious problems center on zoning regulations, dredging, and insurance.

In addition, the study will survey local units of government to determine plans for marina development and facilities currently provided. In addition, the study will recommend criteria for public involvement in the development of marinas by public and private agencies or groups.

Farrish, R.O.

Economics of the Pleasure Boating Market in Connecticut. Agricultural Experiment Station, University of Connecticut, Storrs, Connecticut (Study is currently underway).

Previously unanalyzed data from a survey of marinas were analyzed to obtain revised estimates of gross volume of business and employment. Total income of the industry is estimated at about \$60 million in 1971, with total employment of 1,063 workers. Other data analyzed and published included type of business organization, seasonality, distribution and sources of income, availability of berthing facilities, winter storage, and other facilities and services provided by marinas. A systematic random sample of boat owners was surveyed via a mail questionnaire to determine socioeconomic characteristics of boat owners. In all, questionnaires were mailed to 683 owners and 160 useable responses were obtained.

Gilbert, A.H.

Economic Analysis of the Marina Industry in Vermont. Agricultural Experiment Station, University of Vermont, Burlington, Vermont (Study is currently underway).

Each of the six New England states and New York will conduct individual state surveys of all public and private marinas. A personal interview approach will be used. A sample of pleasure boat owners in each state will also be surveyed by mail questionnaire to determine socioeconomic, participation, and boat and marina preference characteristics. The relationship of the marina industry and its several sectors to the large economy in terms of economic contribution, use of public services, and competition for shore resources will be analyzed through network analysis of the industry. Detailed data on the location of marina facilities by type, size, and expansion plans will be developed.

Gratzner, M. A.; Brown, Tommy

Supply of Rented Recreational Boats in New York State. Sea Grant Office, National Oceanic and Atmospheric Administration, Washington, D.C. (Study is currently underway).

This study will assess the role the charter-rental boat industry plays in resource use and resource allocation and in determining general recreational patterns. It will also (1) identify vessels now available

for lease and under what conditions; (2) identify the geographic, physical and socioeconomic factors responsible for the present distribution pattern of the rental boat industry; and (3) evaluate the expansion potential of the charter boat industry.

Holecek, D. F.

Impact of Great Lakes Recreational Boating on the Economy of Michigan.

Agricultural Experiment Station, Michigan State University, East Lansing, Michigan (Study is currently underway).

The study's primary purpose is to develop estimates of the impacts on Michigan's economy which result from recreational boating that occurs in southwestern Michigan. Estimates of gross dollar expenditures, the total regional income these expenditures stimulate, and the number of people employed because of boater expenditures will be derived. The focus of this study will be on the economic impacts attributable to recreational boating via motorized and sail craft at least 20 feet in length; thus, the estimates will not take into account expenditures by recreationists utilizing commercial craft, i.e., charter craft nor craft smaller than 20 feet in length. Following the development of estimates for southwest Michigan, the second study objective is to develop similar estimates for the entire state of Michigan.

Laundergan, J. Clark; Raiola, Michael P.; Murray, James D. 1977.

Western Lake Superior Recreational Boating Needs and Use Patterns.

Office of Sea Grant, National Oceanic and Atmospheric Administration, Rockville, Maryland. NTIS: PB-275-357.

This report is primarily a data base that will assist recreation planners in the state of Minnesota. Information is presented on the background characteristics of boaters and boats; boat use and evaluation of home ports, voyages and ratings of facilities; recreational facilities and ratings; and conclusions.

Miller, G.F.; Cable, R.J. 1977.

Pleasure Boating in Bridgeport, Connecticut. Office of Assistant Secretary for Policy Development and Research, Department of Housing and Urban Development, Washington, D.C. NTIS: PB-278-735.

The purpose of this study was to investigate the potential for and feasibility of expanded pleasure boat berthing within the confines of the waterfront of Bridgeport, Connecticut. The report will be turned over to a public or private developer for implementation of such recommendations as may result from the study. Inherent in the objective of this report was an analysis of the financial aspects for such a venture.

The overall results of this investigation pointed to the need for and the recommendation of a full-service marina to be constructed on city owned park land and subsequently leased on a long-term basis to an experienced marina operator--in conjunction with a marine trades vocational training program to help increase the employability of certain segments of the Bridgeport population.

Noden, Dick; Brown, Tommy. 1977.

New York Recreational Boating Survey. Office of Sea Grant, National Oceanic and Atmospheric Administration, Rockville, Maryland.

NTIS: PB-275-210.

In 1971, approximately 400,000 pleasure boats were registered in New York. Of these, 62 percent were under 16 feet in length; 32 percent were between 16 and 26 feet; and only 6 percent were over 26 feet. Ten counties accounted for 60 percent of the New York registered boats. New York City and Long Island accounted for 35 percent. Boaters reported the hardest services to obtain were pumpout facilities, emergency repairs, and docking space. Of the respondents, 42 percent used a more distant destination facility chiefly to avoid crowding, poor facilities, or polluted waters. The biggest complaints of New York boaters were inconsiderate boaters and water skiers, crowded facilities, and polluted waters. The most important priorities for the expenditure of public monies for boating included additional launching facilities, the enactment of water pollution laws, and the education and licensing of boaters.

Recreational Boating Task Group of the Navigation Work Group. 1975.

Great Lakes Basin Framework Study: Appendix R9, Recreational Boating.

Great Lakes Basin Commission, Ann Arbor, Michigan.

This study is a comprehensive supply/demand analysis of recreational boating in the Great Lakes Basin. The number of registered boats in the Basin is expected to nearly double from 900,000 in 1968 to 1,754,000 by the year 2020. Satisfying the needs of these additional boaters will require doubling the facilities now available. Latent boating demand, boat movements, and boat use in terms of user days and location require future study due to the current lack of data.

Rosenstock - Holland Associates. 1965.

Feasibility Survey Report: Lake Front Development, Conneaut, Ohio.

Area Redevelopment Administration, U.S. Department of Commerce, Washington, D.C.

The purpose of this study is to conduct a review of the market potential in northeastern Ohio and northwestern Pennsylvania for water-oriented recreational facilities. Based on these findings the study determines the cost, revenues, and methods of financing for water-based recreational facilities.

Rosenstock - Holland Associates. 1965.

Feasibility Survey Report: Recreational Marina, Ashtabula, Ohio. Area Redevelopment Administration, U.S. Department of Commerce, Washington, D.C.

The purpose of this study is to conduct a review of the market potential in northeastern Ohio and northwestern Pennsylvania for water-oriented recreational facilities. Based on these findings the study determines the costs, revenues and methods of financing for water-based recreational facilities.

Sinclair, William F. 1978.

The Federal Small Craft Harbors Program on Lake Erie: The Socioeconomic Need for the Program and Its Potential for Success. Fisheries and Marine Service, Department of Fisheries and the Environment, Ontario Region, Burlington, Ontario, Canada.

The report analyzes the need and socioeconomic benefit of a program to satisfy the commercial fishing and recreational boating needs in Ontario, Canada.

Snell Environmental Group. 1978.

Marina Study: Master Plan Report for the City of Ashtabula, Ohio. Ashtabula Port Authority, Ashtabula, Ohio.

The purpose of the study is to select a site and develop a master plan for a small refuge harbor for the city of Ashtabula, Ohio, and surrounding areas.

Vars, R.C.

The Demand for Recreational Boat Moorage and Storage. Sea Grant Office, National Oceanic and Atmospheric Administration, Washington, D.C.
(Study is currently underway).

The study is investigating three areas of recreational boat moorage demand: (1) collect data on cost of boat moorage and boat storage facilities along the Oregon Coast; (2) estimate demands for recreational boat moorage and storage along the Oregon Coast; and (3) estimate the optional investment in boat moorage and storage facilities given projected demands to 1985.

Wenner, K.A.

A Study of Lake Erie Recreation in Ohio.
Ohio Agricultural Research and Development Center, Wooster, Ohio
(Study is currently underway).

The study is developing a comprehensive inventory of Lake Erie marine recreation facilities and services that will: provide the boating industry information that will assist the industry in providing the

facilities and services desired by the boater; provide the boater with information concerning the availability of facilities and services in a given locality; and provide local communities with information concerning the relative importance of the marina industry in terms of local employment and subsequent payroll.

BEACHES AND SWIMMING

BEACHES AND SWIMMING

Relatively little research has been addressed to the problem of factors influencing the recreational use of beaches. The following is a brief review of some of the recent work conducted in the area of recreational beach use, the effect of water quality on usage, and factors influencing visitors' willingness to pay for beach usage.

Brown, Tommy L.; Reetz, Gene P. 1976.

Swimming Participation and Water Quality in Tompkins County, New York.

Cornell University, Ithaca, New York.

NTIS: PB-261-357.

A systematic sample of Tompkins County households was surveyed to determine frequency of swimming participation, the degree to which residents swim in waters not approved for swimming, degree of public understanding and agreement with existing swimming standards, and the degree to which swimming participation is affected by perceptions of water quality. Attitudes toward water quality appear to have some influence in swimming participation and the choice of swimming area, but in Tompkins County, other considerations such as convenience were more important.

Cartee, Charles P.; Williams, D.C., Jr. 1978.

Factors Affecting the Use of an Artificial Beach: A Case Study on

Mississippi's Gulf Coast. Mississippi State University, Mississippi State,

Mississippi. NTIS: PB-289-393.

The study's purpose was to provide basic data relative to the utilization of a 26-mile man-made beach in Harrison County, Mississippi, and to determine factors related to beach use. The project's main purposes were to quantify the level of beach usage by delineated zones at selected periods of the year; determine the characteristics of users and factors prohibiting or encouraging their use of the beach; appraise consumer perception of water quality and its relationship to beach usage; and review the various legal, political and jurisdictional factors affecting the future development and use of the resource.

A significant difference was found between resident and nonresident perceptions of beach water quality while no significant difference was found in activity usage of the beach between the two groups. Lack of public restrooms was most noted by participants as factors detracting from their recreational experience.

Heatwole, C.A.; West, N.

Beach Use and User Constraints in the New York City Coastal Region. Sea Grant Office, National Oceanic and Atmospheric Administration, Washington D.C. (Study is currently underway).

This study will (1) classify all federal, state, and city beaches located in New York City and adjacent parts of Nassau County on the basis of beach characteristics, location, and intensity of use; and identification of local beaches versus regional beaches; (2) determine the socio-economic profile of the beach user for the purpose of: a. defining the "market area" for each beach or the area from which each beach draws its users; b. analyzing the relationship between beach user profiles and market area; and (3) identify and analyze the relationship between beach access factors--as identified by users--and the physical measurement of these factors.

McConnell, Kenneth E. 1977.

"Congestion and Willingness to Pay: A Study of Beach Use."
Land Economics 53(2), May 1977. pp. 185-195.

In this paper a model for estimating the demand for congested recreation sites in densely populated areas is developed and applied. The model is used to estimate benefit functions for a set of Rhode Island beaches. The paper demonstrates the management strategies for short-run decision-making by comparing optional beach usage implied by benefit functions with the standards of beach usage established by the Bureau of Outdoor Recreation and the State Comprehensive Outdoor Recreation Plans of several states. In addition to providing insight into the methodology for estimating the effect of congestion, this paper suggests a technique which may be used to re-examine standards for beach usage.

Spaulding, Irving A. 1976.

Factors Influencing Willingness to Pay for Use of Marine Recreational Facilities: Sand Beach. Agricultural Experiment Station, Rhode Island University, Kingston, Rhode Island. NTIS: PB-761-838.

Willingness to pay for the use of a beach and its facilities is seen as related to people's life situations and their psycho-social characteristics. The study found that people were willing to pay for beach maintenance and improvement and for services they listed as the natural setting of the beach, its lack of commercialization, and its spaciousness. Also seen as having an influence on people's willingness to pay is the type of household of which they are a member. Families are most willing to pay, but people living alone are most willing to pay the highest amounts. Both the act of paying and the amount people are willing to pay are seen as socially oriented.

COMMERCIAL FISHING AND CHARTER BOATING

COMMERCIAL FISHING AND CHARTER BOATING

Because commercial fishing and the charter boat industry in the Great Lakes is minor in comparison to other sections of the country such as the Atlantic and Pacific coasts, little research or data collection has been accomplished relating to Lakes Ontario, Erie, St. Clair and the connecting waterways. The following reports include the most recently published data bases concerning volume and value of landed catches, employment, type and quantity of gear used, and number of fishing craft. Also included are studies profiling the charter boat fishermen and economic impacts of the commercial fishing and charter boat industry.

Anonymous. 1976.

A Survey of Commercial Sport Fishing Craft. Board of Engineers for Rivers and Harbors, U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

The basic purpose of the study was to develop economic data that would be useful for computation of monetary benefits for sport fishing activities. Of primary interest were the types and intensity of sport fishing taking place in various sections of the Atlantic Coast, the growth in fishing activity, the costs of commercial operations and the fees paid by the fishing public.

Bell, Thelma I.; FitzGibbon, Donald S. (editors) 1978.

Fishery Statistics of the United States. National Marine Fisheries Service, Washington, D.C. Statistical Digest No. 69.

This report contains a review of U.S. commercial fishery statistics for the calendar year 1975. These statistics include data on the volume and value of landed catches, employment, quantity of gear operated, and number of fishing craft. Also included are data on the volume and value of production of processed fishery products, freezings and cold storage holdings, and foreign trade in fishery commodities.

Buettner, Howard J. 1966.

Commercial Fisheries of the Great Lakes, 1879 - 1966. Bureau of Commercial Fisheries, Fish and Wildlife Service, Ann Arbor, Michigan. Historical Fisheries Statistics No. 13.

This report presents a narrative history of the U.S. commercial fishing on the Great Lakes. In addition, it presents available catch data in a manner that provides an easy reference to information that heretofore has appeared in various publications.

Centaur Management Consultants, Inc. 1975.

Economic Impacts of the U.S. Commercial Fishing Industry. National Marine Fisheries Service, Washington, D.C. NTIS: COM-75-11354.

The purpose of this study was to measure the economic impacts of the U.S. commercial fishing industry. Of primary importance were: (1) to measure the national economic impacts of the U.S. fishing industry; (2) to determine the distribution of these impacts among different segments of the fishing industry; (3) to provide a procedure for measuring the national economic impacts of regional U.S. fisheries; and (4) to provide an approach for evaluating the benefits, costs and other impacts of public programs to assist commercial fishermen. Of secondary importance were reviews of: (1) the environmental impacts of the fishing industry; and (2) selected socioeconomic characteristics of fishermen or fishing communities.

Ditton, R.B.; Strang, W.A.; Dittrich, M.T. 1975.

Wisconsin Lake Michigan Charter Fishing Industry. University of Wisconsin Sea Grant College Program, Madison, Wisconsin. Advisory Report No. 11.

Since the Wisconsin Department of Natural Resources began stocking trout and salmon in Lake Michigan, the charter boat industry has had major impact on several coastal communities. The primary beneficiaries of tourist dollars spent in connection with charter fishing were restaurants and taverns, hotels and motels, service stations and grocery stores. Direct sales to charter boat customers in 1973 amounted to \$1,660,000, which adds up to nearly \$4 million in total sales when multiplier effects are taken into consideration.

Glenn, Carls E. 1978.

Long Island Boat Fishermen. Sea Grant Institute, Rockville, Maryland.

NTIS: PB-284-446.

This study of Long Island charter and party boat fishermen is based on a user survey conducted in 1975. Included is an examination of demographic characteristics of boat fishermen, an evaluation of selected activity characteristics, and a measure of user attitudes, opinions, and values. Study results are discussed along with the implications these findings may have on the boat fishing industry.

Noetzel, Bruno G. 1977.

Revenues, Costs and Returns from Vessel Operation in Major U.S. Fisheries. National Marine Fisheries Service, Washington, D.C. NTIS: PB-265-275.

The revenues from operation of fishing vessels in selected U.S. fisheries in the Atlantic, Pacific and Gulf of Mexico are evaluated. The purpose of the analysis is to provide insight into the earnings capabilities of vessels operated in various U.S. fisheries during a period of time characterized by abruptly mounting fuel prices with resulting general deterioration of the economic performance in fisheries in the United States.

Synergy Incorporated. 1974.

A Baseline Economic Forecast of the U.S. Fishing Industry. Volume I. A Baseline Economic Forecast of the U.S. Fishing Industry: 1974-1985; Volume II. Economic Forecast Data Base; Volume III. Computer Documentation; Volume IV. Technical Appendices. National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Washington, D.C. NTIS: COM-75-11156.

This report was developed as background information for the National Plan for Marine Fisheries. Presented is a baseline forecast of the economic characteristics of the U.S. fishing industry during the years 1974-85 under documented assumptions. The study is in four volumes: Volume I contains the executive summary and the summary report on the techniques and conclusions of the study. Volume II is a reference volume that contains graphic plots and listings of data on the thirty major U.S. fisheries and on other sectors of the U.S. fishing industry. Volume III contains computer documentation, including detailed user instructions and annotated program listings. Volume IV contains technical appendices which explain several of the problems encountered in performing the study and the compromises that were necessary. The historical data base and forecast methodology are computerized which permits the forecast to be updated periodically with current data and modified by employing different assumptions.

DEMAND ANALYSES

DEMAND ANALYSES

Water-based recreation is very important within the overall recreation picture. Recreation activities such as swimming, fishing and boating are among the most popular resource-oriented recreational activities. Visitations to water-oriented recreation facilities and areas have increased at a rapid pace, and in the future might increase even more rapidly than other types of recreational area visits.

It is obvious that enlightened planning for increased recreation facilities is essential. It is less obvious, but no less true, that planning for those expanded facilities requires a greater understanding of recreation demand--of the nature and extent of participation, of participant behavior, desires, and levels of satisfaction. This greater understanding is prerequisite to planning the type, extent and locations of new facilities, modifications to existing ones, and the economic impacts of recreational developments. The following is a review of the major recreation demand studies primarily dealing with water-based recreational facilities.

Brown, Richard E.; Hansen, William J. 1974.
Plan Formulation and Evaluation Studies: Recreation, Volume V -- A Generalized Recreation Day Use Planning Model. Institute for Water Resources, U.S. Army Corps of Engineers, Fort Belvoir, Virginia. NTIS: AD/A-000-652.

This report presents refined procedural guidelines for estimating reservoir recreation use and benefits for planning of water resource developments. The general planning model described and tested consists of the development of regional estimators for predicting recreation use at proposed reservoir projects and the operation of these estimators to derive the individual project demand schedules for estimating recreation benefits. The methodology presented is theoretically and empirically more precise than estimating procedures currently employed and is consistent with other existing and proposed authoritative standards for evaluating water resource developments.

Cicchetti, Charles J.; Fisher, Anthony C.; Smith, Kerry V. 1973.
"Economic Models and Planning Outdoor Recreation." Operations Research, 21(5):1104-1113.

The growth in outdoor recreation activity over the past decade and the increased limitations on the supply of natural environments and facilities required as inputs to this activity have precipitated growing concern on the part of planners and managers over the adequacy of recreational facilities. This paper reviews the major economic modeling approaches for forecasting recreation activity and for measuring the benefits from it.

These approaches are major considerations in decisions on the planning, provision, and management of recreation areas and facilities.

Cooper, Rollin B. 1974.

Upper Great Lakes Regional Recreation Planning Study. Part 2: Recreation Demand Survey and Forecasts. Recreation Resources Center, University of Wisconsin - Extension, Madison, Wisconsin.

This study is a survey of recreation activity in 1972. It summarizes the results of 6,442 telephone interviews of representative households in the nine-state region including and surrounding the Upper Great Lakes region, i.e., Minnesota, Michigan, Wisconsin, North Dakota, South Dakota, Iowa, Illinois, Indiana, and Ohio. A small supplementary survey of overnight lodging establishments in the region was also conducted to provide a rough estimate of visitors coming from outside the nine-state study area.

The study also forecasts future recreation participation in the Upper Great Lakes region for the year 1980 using socioeconomic variables, supply and youth-related factors which have been found to influence present recreation behavior. Future recreation participation is presented by recreation activity and by multi-county zones.

Ditton, Robert; Goodale, Thomas. 1972.

Marine Recreational Uses of Green Bay: A Survey of Human Behavior and Attitude Patterns. Office of Sea Grant, National Oceanic and Atmospheric Administration, Rockville, Maryland. NTIS: COM-73-10261.

A survey of 2,174 heads of households in the Green Bay area showed that over two-thirds of those interviewed participated one or more times in fishing, swimming or boating during the 12 months prior to the survey. Frequency of participation was highest for fishermen and lowest for boaters. The popularity of the recreation facilities of Green Bay is presented. A direct relationship between water quality and recreation use is clearly demonstrated. The relationship between education, place of residence, and participation in marine recreation is discussed. Opinions on Bay water quality problems were also surveyed.

Hammon, Gordon, A.; Cordell, Harold K.; Moncrief, Lewis W.; Warren, Roger; Crysdale, Richard; Graham, John. 1974.

Capacity of Water-Based Recreation Systems. Part I: The State of the Art-- A Literature Review. North Carolina Water Resources Research Institute, Raleigh, North Carolina. NTIS: PB-232-092.

Recreation capacity is a popular concept, but there is no established rationale or methodology for understanding, measuring, and applying it. This report recognizes the complex and dynamic nature of capacity by reviewing the literature in terms of five categories of factors which influence capacity: (1) administrative, (2) biological, (3) physical, (4) social, and (5) temporal. The literature is dominated by published reports dealing primarily with physical factors and secondarily with social factors. Administrative, biological, and temporal factors have received minor attention in the literature.

The applicability of Liebig's law of the minimum (the occurrence and functioning of an organism is limited by the essential environmental factor, or combination of factors which is present to the least favorable extent) to the concept of capacity is discussed. The final section reviews the empirical research efforts which have been applied to capacity conceptualization and measurement. To date, this effort has been meager and fragmented.

Hammon, Gordon A.; Cordell, Harold K.; Moncrief, Lewis W.; Warren, Roger; Crysedale, Richard; Graham, John. 1974.

Capacity of Water-Based Recreation Systems. Part II: A Systems Approach to Capacity Analysis. North Carolina Water Resources Research Institute, Raleigh, North Carolina NTIS: PB-236-069.

This is the second in a series of reports designed to develop methods, models and guidelines useful to lake managers as they seek to measure or predict capacity as a step toward optimizing the recreational output of lake systems.

This report applies systems concepts to the problem of analyzing the capacity of water-based recreation systems. The conceptual framework of a simulation model and a number of explanatory models representing boat- ing behavior are presented.

Hecock, Richard D.; Rooney, John R. 1971.

An Analysis of Latent Demand for Water-Based Outdoor Recreation Facilities. Oklahoma Water Resources Research Institute, Oklahoma State University, Stillwater, Oklahoma. NTIS: PB-210-809.

The extent and character of latent or unfulfilled demand for water-based recreation in Oklahoma are studied. To estimate recreation participation, facility use, and future demand, a household questionnaire was designed and administered to 4,000 Oklahoma households during the summer of 1969. The data gathered concerned trip expenditures, type and amount of participation in several outdoor activities, important decision-making parameters in the selection of facilities, and personal characteristics of the respondent. The survey indicated that about 30 percent of Oklahoma's families do not participate in any water-based recreation.

Forty-five percent did no swimming, and nearly 60 percent failed to boat. The forces that seemed to be important to this repressed demand included satisfaction levels, life-cycle stage, leisure time availability, income, proximity to resources, and perception of water resource characteristics. Among these variables, income, time, and life-cycle were the most important. These findings have immediate applications for resource managers. Future increases in income and leisure time are likely to substantially increase demand. It is, therefore, important to predict the location and extent of income and leisure time growth so that those resources most affected can be developed or modified to meet the demand.

Mitchell, Arnold; Dodge, Burnham; Kruzic, Pamela; Miller, David; Schwartz, Peter; Suta, Benjamin. 1975.

Handbook of Forecasting Techniques. Institute for Water Resources, U.S. Army Corps of Engineers, Fort Belvoir, Virginia. IWR Contract Report 75-7.

The report is designed to help planners in the Army Corps of Engineers improve their expertise in long-range forecasting. Twelve basic methods suitable for a wide range of technological, economic, social, and environmental forecasting are selected and discussed. Procedures for using each method are described and illustrated with examples. Some 150 forecasting techniques are listed in the appendix.

Tapiero, Charles S. 1974.

"The Demand and Utilization of Recreational Facilities." Regional and Urban Economics, 4(2):173-185.

While it is evident that there is a need to provide greater quantity, quality and diversity in recreational facilities, it is difficult to estimate potential demand and utilization for such facilities. This paper provides a probability model for estimating the probability distributions of both these demands and utilizations and draws implications for public decision-making concerning the location of such facilities. Because of the numerical difficulties inherent in computing these probability distributions, process simulation is suggested as an efficient mechanism testing alternative locational decisions.

White, Andrew N. 1979.

"Accessibility and Public Facility Location." Economic Geography, 55(1): 18-35.

The concept of accessibility of service facilities to target populations is an inadequate criterion for public facility location problems, since it over-emphasizes dispersed facilities as location solutions. Without consideration of interactions and linkages between services in public facility systems, the complete range of facility location patterns that can

be observed in urban settings cannot be characterized. Through techniques of spatial pattern analysis, different degrees of facility concentration are demonstrated to exist for human service systems in selected urban areas. A method for co-locational analysis is also introduced in order to examine the nature of locational interdependence and its role in describing the structure of public facility concentrations. Given the empirical evidence and a theoretical basis, it is argued that the criterion of facility accessibility should be considered along with a criterion of facility linkage or agglomeration in any comprehensive locational analysis of public facilities. Furthermore, the analytical usage of accessibility can be appropriately expanded to evaluate both facility systems and individual facilities.

COST-BENEFIT ANALYSES

COST-BENEFIT ANALYSES

Cost-benefit analysis is a practical way of assessing the economic performance of projects. It implies the enumeration and evaluation of all the relevant costs and benefits. This involves drawing on traditional economic theory--welfare economics, public finance, resource economics--and trying to weld these components into a coherent whole.

It is always important, and perhaps especially so in economics, to avoid being swept off one's feet by the fashions of the moment. In the case of cost-benefit analysis, one must recognize that it is a method which can be used inappropriately as well as appropriately. There are two very clear general limitations of principle (as distinct from the many more of practice) which must be recognized at the outset. First, cost-benefit analysis as generally understood is only a technique for making decisions within a framework which has to be decided upon in advance and which involves a wide range of considerations, many of them of a political or social nature. Secondly, cost-benefit techniques as so far developed are least relevant and serviceable for what one might call large-size investment decisions. If investment decisions are so large that they are likely to alter the relative outputs or prices over the whole economy, the standard technique is likely to fail; for nothing less than some sort of general equilibrium approach would suffice in such cases.

The problem of estimating and valuing recreational gains or losses due to projects has received a good deal of attention. The following is a review of some of the most recent work done in the area of recreation benefit and evaluation.

Anonymous. 1979.

Manual of Procedures for Evaluating Benefits and Cost of Federal Water Resources Project. U.S. Water Resources Council, Washington, D.C. (March 7, 1979 Draft).

The purpose of this report is to provide federal agencies engaged in water and related land use planning with acceptable recreation benefit valuation methods and criteria, together with procedures and implementation of these methods on a consistent basis.

Brown, Richard E.; Grane, Dale M. 1974.

Plan Formulation and Evaluation Studies--Recreation. Volume II: Estimating Initial Reservoir Recreation Use. Institute for Water Resources, U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

This report presents methodology for estimating initial recreation use at prospective Corps of Engineers reservoirs. It is the outgrowth of recreation-use studies instituted by the Office of the Chief of Engineers, Washington, D.C. The procedure described utilized the "most similar project" concept; i.e., an existing reservoir that is most comparable in size, operation, and anticipated recreation-use characteristics. Relating recreation-use information from an existing reservoir to a reservoir under study provides the basis for the use estimating technique. The report provides general descriptions, pertinent project information, and recreation-use data for 52 existing Corps reservoirs. It includes detailed discussion and evaluation of a prospective reservoir project and general criteria for selecting a similar project from among those reservoirs included. For illustrative purposes, an example detailing the application of the methodology is furnished.

Brown, Richard E.; Hansen, William J. 1974.
Plan Formulation and Evaluation Studies--Recreation. Volume II: A Preliminary Analysis of Day Use Recreation and Benefit Estimation Models for Selected Reservoirs. U.S. Army Institute for Water Resources, Fort Belvoir, Virginia. NTIS: AD/A-000-650.

This report presents a methodology for estimating recreation use and recreation benefits at existing and proposed Corps of Engineers reservoirs. Multiple linear regression analysis is employed to develop two regional day use estimating models from recreation use survey data collected at 19 Corps reservoirs.

The travel-cost method, which employs a "proxy for price" to derive demand schedules from regional estimators, is presented. The model is illustrated by deriving demand schedules for the study reservoirs and estimating their recreation benefits.

Brown, Richard E.; Mueller, Geoffrey. 1974.
Plan Formulation and Evaluation Studies--Recreation. Volume IV: Estimating Recreational Facility Requirements. U.S. Army Institute for Water Resources, Fort Belvoir, Virginia. NTIS: AD/A-000-651.

This paper presents a general methodology for the determination of the number and type of recreation facilities needed to serve a given number of reservoir recreation days of use. It is a method synthesizing planner judgment, existing recreation use data, and the concepts of estimating annual recreational use employed by the Corps of Engineers. The data utilized were collected at 52 reservoirs over the period 1966 through 1969.

Cicchetti, C.J.; Smith, V.D.; Knetsch, J.L.; Patton, R.A. 1971.
"Recreation Benefit Estimation and Forecasting: Implications of the
Identification Problem. Water Resources Research, 8(4):840-850.
May, 1972.

Recreation studies in the past have confused the terms demand and use. Demand refers to the schedule of quantities that the community will desire at all possible prices. Use or participation is the realization of both demand and supply considerations. Accordingly appropriate information, in addition to the data, must be supplied prior to the estimation of economic models of the recreation market. The identification problem assesses the sufficiency of such information. Since the type of information and the data themselves impose constraints on the specification, estimation, and use of economic models of the recreation market, a taxonomy of each applied study framed around a general equilibrium model of recreation decisions is presented, and the specific applied studies discussed.

Deal, Richard E.; Halbert, Michael H. 1971.
The Application of Value Theory to Water Resources Planning and Management.
Institute for the Study of Inquiring Systems, Philadelphia, Pennsylvania.
NTIS: PB-204-547.

A way to measure non-market benefits or costs of a water resources project was studied using the values of those affected. The literature was surveyed to find how "value" has been defined and used, and an annotated bibliography of articles was prepared on value aspects of water resource projects. Three questions to ask about a project are the following: What kinds of people will this project benefit or hurt and in what ways will it benefit or hurt them? How much will it benefit or hurt them, and how should one combine the various benefits and hurts (or costs) of individual people to get a cost-benefit ratio for a project? The approach was demonstrated in a study of the values of 449 potential visitors to the proposed Delaware Water Gap National Recreation Area. This included the development of a questionnaire to identify the satisfactions people derive from outdoor recreation, and a method of data reduction using factor analysis.

Ditton, Robert; Goodale, Thomas. 1972.
Marine Recreational Uses of Green Bay - A Survey of Human Behavior and Attitude Patterns. Sea Grant Program. University of Wisconsin.
Madison, Wisconsin. NTIS: COM-73-10261.

How people perceive Green Bay as a recreation resource, how perceptions differed between groups, and how these perceptions related to recreation use patterns, are identified. Whereas 7 of 10 household heads interviewed participated in boating or swimming, only 3 of the 10 had used Green Bay during the preceding 12 months, indicating that Green Bay was not a focal point of water-based recreation among residents of the five-county study area. Chi square test groups differed significantly on most comparisons when used to describe the Bay and its most bothersome physical and water quality characteristics. Generally, participants and those who used the Bay were less apt to cite unpleasant smells and dead fish as major problems and more apt to cite such problems as winds, waves, and cloudiness. Comparisons between three user groups (fishermen, boaters, and swimmers) indicated swimmers and boaters differed most in their perception of the Bay and its troublesome characteristics, with fishermen occupying a position between to two groups.

Dwyer, John F.; Kelly, John R.; Bowes, Michael D. 1977.

Improved Procedures for Valuation of the Contribution of Recreation to National Economic Development. Water Resources Center, University of Illinois, Urbana, Champaign, Illinois. Research Report No. 128.

Recreation valuation procedures currently used by federal agencies make almost exclusive use of the "interim unit day value approach," sometimes augmented by point systems. This approach has little theoretical or empirical justification and does not encourage efficient allocation of resources. It is recommended that models be developed to predict individual willingness-to-pay for many types of recreation as functions of site characteristics, the characteristics of the individual user, the availability of substitute activities and sites, and the proximity of the individual to the resources under study. The total value of the resource would then be a function of these variables, the number of users, and the distribution of users within the market area. Examples of models are provided along with guidelines for their development and use.

Economics Section. 1978.

U.S. Army Corps of Engineers, Buffalo District: Harbor Project Evaluations.
U.S. Army Corps of Engineers, Buffalo, New York.

The Economics Section of the Buffalo District, U.S. Army Corps of Engineers evaluated the cost and benefits associated with harbor projects at Rochester, Olcott, Little Salmon River and Barcelona, New York and Ashtabula and West Harbor, Ohio. The evaluation centers on the economic and physical impacts the Corps of Engineers project will have on commercial and sport fishing, commercial shipping, and recreational boating.

Gilbert, A.H.; Winant, Larry. 1977.

The Economic Value of Water-Oriented Outdoor Recreation on Lake Champlain.
New England River Basins Commission. Boston, Massachusetts. NTIS:
PB-293-421.

This report estimates the dollar volume of expenditures generated by five major outdoor recreation activities through the evaluation of expenditure patterns among participants and the gross income of the marina industry on and along the shores of Lake Champlain. The five major recreational activities are: boating, waterfowl hunting, fishing, camping and swimming. The marinas were interpreted as being a separate industry. Such information as size and location, period of operation, berthing capacity, marina employment, and estimated value was examined.

Glascock, Martha G.; Born, John J. 1972.

Determining the Demand and Economic Value for the Water-Based Outdoor Recreation Resources at Lake MacBride State Park in the Summer of 1970.
Iowa State Water Resources Research Institute, Ames, Iowa. NTIS:
PB-204-816.

The purpose of the study was to determine how user patterns relate to the economic values of water-based recreation facilities at Lake MacBride State Park. It included a survey of present demand for existing water-based recreation facilities in the park, determination of socioeconomic variables which may partially explain demand, and monetary values placed on water recreation areas and their use by the consumer. Estimates were made of resultant expanded park use areas and proximity and design of areas and facilities and their potential effect on use patterns. An examination of the sources of water pollution of Lake MacBride was made. In addition, projected levels of pollution were analyzed and recommendations for the alleviation of this problem were made.

Grubb, Herbert W.; Goodwin, James T. 1971.

Economic Evaluation of Water-Oriented Recreation in the Preliminary Texas Water Plan. Texas Water Development Board, Austin, Texas Report No. 84.

The primary objective of this study was the estimation of potential recreation benefits from reservoirs proposed for inclusion in the preliminary Texas Water Plan. Data collected during a 1965 survey of eight Texas reservoirs are used with population and income data to estimate recreation visitation through use of a prediction equation. Counties are the observation units used in fitting an equation to the survey data. The equation represents a least squares regression which is fitted to a double logarithmic transformation of the original data. Statistically significant explanatory variables contained in the equation are population per capita, income, cost of travel to reservoirs, proximity to competing reservoirs, and reservoir size.

Hoffman, J.E.

Relative Value of Water-Related Outdoor Recreation Activities.

Office of Water Research and Technology, U.S. Department of the Interior, Washington, D.C. (Study is currently under way).

This study will develop a method to objectively measure the relative value and management cost effectiveness of water-related outdoor recreation activities. Landowners and public agencies will provide information on the cost of managing for each activity.

Visitors will be asked to compare each activity against all other activities on a paired basis and to indicate which one of the pair provides greater value or enjoyment. From the information obtained from visitors, each activity will be placed on the continuum; and the distance between the location of activities on the value continuum is a measure of relative value.

Holecek, D.F.

Water Based Recreation: Carrying Capacity, User Characteristics, Economics.
School of Agriculture and Natural Resources, Michigan State University, East Lansing, Michigan. (Study is currently under way).

Data collected from over 2,600 users of inland lake public access sites under the jurisdiction of Waterways Division, Michigan DNR were used to identify the parameters of a benefit/use estimation model. A multiplicative model was used which contained the following variables: travel time, lake size, population, income and an index of competition. The model was used to predict use and to estimate benefits at lakes where electronic vehicle counters had been installed. Predictions and counter counts were compared. Predictions and counts were reasonably close when summed across lakes while comparisons for individual lakes exhibited considerable variations. Efforts are under way to reduce this variability. Three spin-off projects have also been completed. First, it was found that stated willingness to pay varies with how respondents perceive the information will be used. Second, those sites designed primarily for boaters were used about equally by non-boaters. Sunbathing, picnicking and swimming are popular non-boating uses of the sites. Finally, users were questioned about what they found attractive and unattractive about the sites.

Kalter, Robert J. 1971.

The Economics of Water-Based Outdoor Recreation: A Survey and Critique of Recent Developments. Institute for Water Resources, U.S. Army Corps of Engineers, Alexandria, Virginia. NTIS: AD-731-774.

This report is a survey and critique of the literature and practice of estimating use of and benefits from outdoor recreation for the purpose of determining the direction of further research efforts by the

Corps of Engineers. The report outlines the conceptual and empirical difficulties associated with the various methodologies in use and suggests promising approaches to improved analysis within the framework of multiple objectives of water resources development.

Meale, Erie R. 1974.

Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison. Office of Water Research and Technology, U.S. Department of the Interior, Washington, D.C. NTIS: PB-289-853.

Application was made of the consumer surplus and economic rent methods of resource valuation for boating recreation in Utah. Total consumer surplus and economic rent values were estimated for 24 boating sites. These values incorporate the relationship existing between the variable use costs and the units of activity associated with the site. The comparison of economic rent and consumer surplus was undertaken through the use of a common mathematical model and empirical observation. Three stages in the calculation procedure were considered in the comparison of the two methodologies. The first stage compared the consumer surplus with the economic rent estimation, and it was found that the economic rent will exceed the consumer surplus. The second and third stages compared the projected values for an origin visiting a site and the total value for a site. No unique relationship was found between the two resource valuation methodologies. The most significant factors contributing to the inconsistent relationship between economic rent and consumer surplus are the utilization of the number of trips in the economic rent model compared to the number of trips per capita in the consumer surplus model, the constant economic rent per trip compared to the decline in the consumer surplus for an additional trip per capita, and the respective projection factors of the two valuation methodologies.

Ravenscraft, David J.; Dwyer, John F. 1978.

Reflecting Site Attractiveness in Travel Cost-Based Models for Recreation Benefit Estimation. Agricultural Experiment Station, University of Illinois, Urbana Illinois. Forestry Research Report No. 78-6.

This paper shows how site attractiveness is implicitly reflected in the basic travel cost model and how an explicit account of the attractiveness of the site being evaluated and substitute sites can be built into the travel cost model. It is concluded that the travel cost method can take adequate account of the attractiveness of the site being evaluated and of substitute sites, so that it is not necessary to use "planner judgment" to reflect the influence of site attractiveness on the willingness of users to pay for use of a site.

Sinden, J.A. 1973.

Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water Based Recreation. Office of Water Resources Research, Department of the Interior, Washington, D.C. NTIS: PB-231-701.

The travel-cost method used to value extra-market benefits implicitly assumes that all users have identical tastes. An alternative approach is suggested which uses a photo-choice game to yield estimates of users' preferences in valuating these benefits. Data showing the utility of this approach were collected from 189 reservoir users in the Cascade Mountains of Oregon and include estimates of tastes and socio-economic characteristics. Tastes were measured as the willingness of users to expend additional time or money, using one of the choices in the photo-choice game to obtain cardinal estimates of preferences. Modified demand functions were estimated for 10 activities with distance as a proxy for price, and tastes as the independent variables. Benefits under this method equal the area under the demand curve. Alternatively, it is suggested that benefits from each of these activities can be determined using indifference curve analysis. Demand curves were generated from the indifference curve and benefits calculated. Finally, indifference curves were used to estimate option demand. Option demand curves can be used to value benefits which can arise from potential future activities.

Somersan, Ayse. 1976.

Impacts of Recreation in the Coastal Zone: Economic Impact and Needs of Wisconsin's Great Lakes Boaters--1975. Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, Washington, D.C. NTIS: PB-263-933.

This report focuses on Great Lakes boating and fishing, since they are activities with the greatest dependency on the Great Lakes. The major objective of the study is to identify the dependency between Great Lakes boaters and the economy of the coastal communities. The report also identifies the socioeconomic profile of the Great Lakes ramp users and marina users, and summarizes the preference and needs of boaters for facilities and services. The increased sports catch on Lake Michigan, which is a result of the fish management policies of Michigan and Wisconsin, has also been responsible for the increased interest in boating on the Great Lakes. Over 80 percent of the recreational boaters surveyed during the 1975 season list fishing as the primary purpose of their boating.

Vickerman, R.W. 1974.

"The Evaluation of Benefits from Recreational Projects." Urban Studies, 11(3), 1974.

The standard practice for the assessment of the benefits and costs associated with the development of sites for recreational activities is to use the methodological framework developed by Clawson. The Clawson method has been criticized, and the uses made of it have usually recognized its inadequacies; but it has been defended as the most satisfactory approach.

This paper argues that there are fundamental criticisms to be leveled at the method and seeks to establish a more acceptable framework for the appraisal of recreational projects.

MISCELLANEOUS STUDIES

MISCELLANEOUS STUDIES

Brown, Tommy L.; Brumsted H.

Improving Recreational Access to the Great Lakes.

Sea Grant Office, National Oceanic and Atmospheric Administration, Washington, D.C. (Study is currently under way).

The study will determine the legal arrangements and agency policies most acceptable to riparian landowners in exchange for public access agreements. The feasibility of a salmon stamp and state income/expenditures from boater taxes as possible methods of improved financing for Great Lakes recreational development is also investigated.

Cortell, Jason M. and Associates, Inc. 1977.

Recreation and Instream Flow.

Volume I. Flow Requirements, Analysis of Benefits, Legal and Institutional Constraints.

Bureau of Outdoor Recreation. Washington, D.C. NTIS: PB-275-269.

Very few provisions for the controlled release of water from dams and other such water resource projects to increase instream flow specifically for water-based recreation exist in the United States. This report deals with such questions as: How much flow is required for recreation; how justified are such flows compared to other needs; and what legal and institutional obstacles exist. The conclusions of the document are: While instream flows for recreational purposes cannot be guaranteed in a specific case, a recreational planner can measure the amount of water required, its value and the obstructions to be encountered.

Cortell, Jason M. and Associates, Inc. 1977.

Recreation and Instream Flow.

Volume II. River Evaluation Manual. Bureau of Outdoor Recreation, Washington, D.C. NTIS: PB-275-270.

This report is intended to provide planners and other potential users with a practical means of applying findings presented in Volume I to a specific river evaluation problem. The emphasis is on physical relationships between discharge and the potential for recreation in the riverine environment. The manual presents methods for using basic principles of hydrology to make predictions of the impact of changes in flow on the basic physical parameters affecting recreation. These methods combine theoretical calculations with field observations. The users of the manual will not become expert hydrologists, but they should be able to make judgments about recreational potential in a river at different levels of discharge.

Neuman, Michael T. 1976.

Public Access to the Great Lakes: A Policy Study/1976.

Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, Rockville, Maryland. NTIS: PB-263-935.

The concept of public access has been defined very generally as a way or a means of getting to and using the Great Lakes. In the past, three future choices in public access directions have been discussed; however, there is also a fourth alternative. This choice is a combination of increasing some types of access (e.g., ramp access) and at the same time decreasing or maintaining the present level of others (e.g., shore access, harboring access).

Scott, Charles C. 1967.

Criteria for Evaluating the Quality of Water Based Recreation Facilities.

North Carolina Water Resources Research Institute, Raleigh, North Carolina. NTIS: PB-214-363.

The study is limited to establishing criteria for day use facilities, roads, parking areas, picnic areas, swimming areas and boating areas. The criteria for each of these facilities is further divided into site selection, design, and construction, and state of maintenance and appearance. Many factors affecting quality were listed, checked with professional practioners, and refined; then they were changed into criteria in the form of questions, followed by interpretations. The criteria were pretested, refined and tested again in the field.